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AMC Pamphlet
AMCP 385-61

# SAFETY DIGEST

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UNITED STATES ARMY MATERIEL COMMAND
WASHINGTON, D.C. 20315

"The mission of the Army Materiel Command is to supply the best available equipment to our using services and to the allies of our Government. Our safety program will play an important part in accomplishing this goal by reducing disabling injuries, accidental fatalities and property damages to the absolute minimum."

F. S. BESSON, JR.
General, USA

# FOREWARD

The Safety Digest is an AMC Pamphlet prepared by the Safety Division, U. S. Army Materiel Command. Its purpose is to disseminate information which can materially influence and improve safety programs at all Command establishments.

Articles are included to supplement technical knowledge as well as practical knowledge gained through experience. They provide a basis for the further refinement of safety measures already incorporated in operating procedures and process layout. To achieve maximum effectiveness, the Safety Digest should be given widespread circulation at each AMC establishment.

Articles appearing in the Safety Digest are unclassified and are not copyrighted. They may be reproduced as desired in order to bring pertinent accident prevention information to the attention of all employees. The Army Materiel Command Safety Digest should be given a credit line when articles are extracted.

Unclassified material believed to be of interest or benefit to other establishments is welcome for publication in the Safety Digest. Please send articles for review to: U. S. Army Materiel Command Field Safety Agency, Charlestown, Indiana. If possible, include pictures, charts, drawings, and illustrations that clarify and heighten interest in your presentation.

* * *

**Front cover shows U. S. Army's "Skycrane". In foreground soldiers are shown dispersing from a litter van. In the background, another "Skycrane" brings in an M-113 Armored Personnel Carrier.**

**The rear cover shows a soldier handling the Redeye weapon system.**

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# AMC SAFETY DIRECTORS ATTEND CONFERENCE AT HEADQUARTERS, AMC

The photo was taken during the Fourth AMC Command Safety Director's Conference at U. S. Army Materiel Command Headquarters on 22 June 1964.

General Bunker, Deputy Commanding General, USAMC, spoke to the group and emphasized the contributions that Safety makes towards saving lives, preventing injuries, and to cost reduction within AMC. Mr. Wilkenson, U.S. Army Director of Safety, discussed the necessity for close cooperation between Army and Command Safety Directors.

AMC and subordinate command safety personnel also attended the Presidential Safety Conference held in Washington, D. C., during the week of 22 June 1964. President Johnson addressed a gathering of industry, labor and governmental safety representatives and called upon every American to work safely and safeguard his fellow workers.

Shown in front row above: Messrs. Queen, AMC; Tyler, AMC; Myers, FSA; Brinkley, SMCOM; Bishoff, AMC; Shirock, MOCOM; and Abraham, AMC. Standing in the rear: Messrs. Kennedy, DCASR (Pilot Test); VanPatten, MUCOM; Blackburn, AMC; Sampson, WECOM; Wilkenson, U. S. Army; Guest, SMCOM; Lerwill, TECOM; Deans, AMC; Savaiko, ECOM; and Davidson, MICOM.

# HANDLING LITHIUM METAL

Thomas P. Browne, Supervisory Safety Engineer
U. S. Army Missile Support Command

New methods to produce and to consume energy at a higher rate are constantly being developed within the missile industry. These bring into use unfamiliar materials that must be handled in new ways. Lithium, one of the liquid metals that appear to have value as heat transfer media, is a material which has required the development of special methods for handling and storing.

Care should be taken to prevent bodily contact with lithium. Contact with the skin or eyes may result in a caustic irritation or burn. Thorough flushing with water is a satisfactory first aid procedure. Solid lithium may be handled by using rubber or plastic gloves or metal tongs. For handling molten lithium, workmen should be protected with flameproof clothing, foundry-type shoes, asbestos gloves, and a head shield.

One type of head protection consists of an aluminum shield covering the front, sides and top of the head. A clear plastic window is set in the front. A flameproof bib of canvas extends down from the front of the shield to cover the chest area to protect the wearer from metal spattering on the chin and neck. It should be emphasized to operating personnel that there is no known fabric which will offer complete protection against burning lithium.

Flameproofed clothing will minimize the area of burn. In cases of burn, the area should be flooded with a liberal amount of mineral oil. The metal should be removed as quickly as possible, and the injured person should be treated for shock and referred to competent medical authorities.

Liquid lithium is quite easily ignited and once burning is difficult to extinguish. Hot or burning lithium will react with all gases except those of the helium-argon group. It also reacts violently with concrete, wood, asphalt, sand, asbestos and nearly everything else except metal.

Water, sand, carbon tetrachloride, carbon dioxide and acid-soda extinguishers should not be used on lithium fires. The inert gases are not effective unless the fire is confined to a container which can be sealed off. Burning lithium can be extinguished by smothering with dry powdered lithium chloride or graphite powder. A supply of one or more of the approved materials, together with a long handled shovel for their application to the fire, should be available wherever lithium is stored or used.

## SOLID LITHIUM at room temperature

Lithium metal is normally supplied as a casting or extrusion of the size and shape best suited to the user's needs. These shapes include ribbon, wire and ingots of various weights and dimensions.

Solid lithium is less active than the molten metal. However, its activity increases sharply as its temperature approaches the melting point. Therefore, handling methods hazards and precautions depend to some extent upon the temperature at which it is used.

Lithium metal is usually stored at room temperature. Precautions must be taken to avoid exposure to water and other materials with which it may react and to prolonged exposure to air. The metal is generally stored in metal drums and surrounded with an inert material. The material most commonly used is a refined white mineral oil, although kerosene and other light petroleum fractions are used. One suitable white mineral oil with a high flash point is 105 BT 40 white oil. Where hydrocarbons cannot be tolerated the metal may be stored in drums filled with dry inert gases such as argon, helium or certain fluorocarbons. Lithium wire and ribbon are often protected by a heavy coating of petrolatum.

When mineral oil is used as the protective medium the ingots may either be totally submerged or they may be coated with a protective film. Total submergence in an airtight container is a positive means of storing the metal for a long period. For practical reasons it is often desirable to store the metal with only the protective film. This is done by packing the ingots in a steel drum, pouring in enough oil to coat the metal and provide a two to three inch layer of oil at the bottom, and by rotating the drum at least twice a month. Metal so packed may be satisfactorily stored for several months.

Because drums are not airtight a slow deterioration of metal will occur in spite of the oil film. For this reason, lithium metal which is to be stored for periods longer than two or three months should be kept totally submerged in mineral oil in airtight containers or in airtight drums filled with a suitable inert gas. Thus protected, lithium will remain in good condition indefinitely.

In most cases before the metal is used it is necessary to remove the protective coating of oil or petroleum. Hydrocarbon solvents, such as Stoddard's solution, may be used with normal precautions. Degreasing is carried out by gently agitating the metal in the solvent, draining off the excess and drying in air.

Ethers, alcohols, unsaturated hydrocarbons or any solvent containing moisture must not be used to clean lithium metal. While carbon tetrachloride has been used, particularly for preparing laboratory samples, its use is not recommended because explosive reactions have occurred when used similarly for cleaning sodium metal.

Freshly cut, cast or extruded lithium exhibits a bright silvery surface, which on exposure to ordinary air quickly darkens and becomes quite black, although for some time this will be only very superficial. This black coating is probably not nitride, as commonly supposed, but hydroxide. See Deal and Svec, Journal of the American Chemical Society 75,-173, 1953.

**On prolonged exposure, reactions with the oxygen, moisture and carbon dioxide of the air proceed to form** lithium hydroxide and lithium carbonate. Even when coated with an oil film, the reaction with air will proceed slowly with the ultimate formation of a slimy coating of oil and lithium hydroxide. All of these alteration products which may have formed during storage should be removed by scraping before use to prevent contamination and hazard, particularly when the metal is to be melted.

It has been noted that when lithium metal is stored dry in a container which is not entirely airtight the deterioration product is a dense, brittle, reddish brown material, probably largely lithium nitride. This is in marked contrast to the soft white hydroxide and carbonate product which forms when the dry metal is left freely exposed to the atmosphere at room temperature.

Metal drums, reaction vessels, tools and any ferrous metals with which lithium metal is liable to come into contact should be free of rust. When lithium is rubbed against a rusty surface, sparks often result, creating an explosion hazard if **flammable gases are present.**

Lithium metal may be readily cut in air at room temperature without danger of fire. A coating of oil on the cutting blade will help to prevent the metal from adhering to the tool.

## ● SOLID LITHIUM at elevated temperature

Notable differences between the activity of lithium at room temperature and at temperatures approaching the melting point are the changes in its affinity for nitrogen and its reaction with water.

At ordinary room temperature lithium reacts very slowly with nitrogen, but at higher temperatures this reaction is greatly accelerated. Warm lithium metal, when not adequately protected with oil or inert gas, may be completely converted in a relatively short time to a heavy reddish-brown solid consisting largely of lithium nitride. Although the reaction is exothermic, it does not usually proceed rapidly enough to melt the metal or cause it to ignite.

Special care must be taken to avoid contact of water with hot lithium. Cold lithium reacts slowly with water and the hydrogen formed seldom if ever ignites. The reaction is much more vigorous and dangerous at elevated temperatures, and enough heat may be generated to ignite the hydrogen, causing fire and possible explosion.

## ● LIQUID LITHIUM METAL

Molten lithium metal is much more active than the solid, but it may be safely handled if the proper precausions are observed.

At low temperatures (190-225°C.) lithium may be melted in an electically heated mineral oil bath with automatic temperature control. The molten metal will float on the oil, but due to surface tension effects it will have a protective film of oil. At times during the melting operation it is desirable to renew the oil film by gentle stirring with a steel rod or by dripping a little oil directly onto the metal surface. Transfer

of the metal from the melting pot may be made with a steel or stainless steel ladle or by means of a pouring spout on the pot.

If it is desired to melt lithium at temperatures above 225°C., an oil bath cannot be used. Such melting is best done in a closed steel vessel in which an inert atmosphere of argon or helium can be maintained.

## LITHIUM SCRAP

In handling and using large quantities of lithium metal some scrap will accumulate in small pieces of left over metal, scrapings, process by-products containing unreacted lithium, sludge from melting operations, nitrided metal, and partially burned metal. Disposal often presents a problem. Small pieces of metal can of course be sorted out, stored and reused. When metal is melted, a sludge separates out. It is composed of nitrides, oxides, possibly carbides under certain conditions, and some trapped metal. Scrap from partially burned metal may contain oxides, nitrides, carbides, silicates, and salts, depending upon the nature of the material which has come in contact with the burning metal.

All such sludges and residues should be stored under oil until they can be disposed of. In general it is difficult if not impossible to recover the small amount of lithium metal present. In most cases the only practical method of lithium recovery is by water leaching with the resultant conversion of the metal, carbides, and nitrides, to lithium hydroxide. At best this is a hazardous operation. The hydrogen formed, together with small amounts of acetylene from the carbides present, may ignite with a resulting sharp explosion. The operation should be carried out in an open vessel, isolated from buildings and personnel. The remaining alternative is to burn the material in a suitable disposal area.

Residual lithium adhering to containers, reaction vessels and tools can usually be washed with water provided that the quantity of metal is not excessive, the equipment to be cleaned is at room temperature, and there are no lithium sludge products present whose activity with water is excessive or unknown. Generally water cleaning is best done out-of-doors.

Comprehensive data is not available as to the effects of lithium on various materials. Tests have been made on a great many different materials of construction but in many cases the results are qualitative only. Where corrosion occurs it is not always known whether the effect is due to lithium itself or to its normal content of impurities. For most ordinary users where lithium is to be stored or melted, mild steel is satisfactory.

All personnel who work with lithium metal should be thoroughly instructed on the hazards involved. Most accidents resulting from the use of lithium occur among inadequately trained personnel.

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A comprehensive discussion of safety practices for handling lithium is contained in "Alkali Metals Safety Guide", by Preston L. Hill, published by the Y-12 Alkali and Liquid Metals Safety Committee of the Atomic Energy Commission, Oak Ridge, Tennessee.

## SAFETY EXTENSION COURSES

Safety extension courses for civilian personnel in the safety management field have been added by the U. S. Army Adjutant General School, Fort Benjamin Harrison, Indiana. The three courses include entrance level training available to personnel in GS grades 5 through 7; intermediate level training, grades 9 through 11; and senior level training in grades 12 through 14. Applications should be submitted on DA Form 145 through channels to Director, Extension Course Student Administration, U. S. Army School Center/Post Headquarters, Fort Benjamin Harrison, Indiana 46216.

# SAFE AIR COMPRESSOR OPERATION

Fred N. McKenzie
Safety Department, Sperry Rand Corporation
Louisiana Army Ammunition Plant

Properly installed air compressors, obtained from experienced, reliable manufacturers, seldom are involved in accidents caused by defects in their fundamental designs. Most air compressor accidents are the result of inadequate operating procedures.

The following factors should be checked to assure safe air compressor operation:

Governors - The best compressors are designed and equipped with governors. These governors should be checked to make sure they act independently of the unloader and do not allow the source of power to race when the unloader operates.

Safety Valves and Pressure Gauges - Under no circumstance should an air receiver be without a pressure gauge and a safety valve. The valve should be tested from time to time to assure safe operation. If the receiver is located outside, a hood should be provided to protect the valve from the weather.

Compressor Lubrication - Most compressor explosions are attributed to volatilization of lubricating oil. Whether this is true or not, enough is known to make the best authorities recommend that special attention be given to insuring that only the best lubricating oil is used in compressors. Operators should be careful to supply the exact amount of lubricating oil recommended by the manufacturer.

Air Intake - It is particularly important that the air used in compressors be free of explosive properties. Care should be given to the location of the air intake. Air intake locations should be kept free of volatile liquids and explosive dusts. Intake pipes should be short and straight to minimize the danger of pockets for foreign materials.

Cooling Water - Cold water should be obtained from a dependable source to cool air compressors. An apparatus

should be installed for visually checking the flow of water on the discharge side of the **cylinder water jacket** to assure the compressor is being adequately cooled. Water jackets should be cleaned of scale and foreign substance as often as needed for a better cooling effect.

Machine Guarding - Although most manufacturers are conscious of the need of machine guarding, some improvements may be needed to guarantee the operator's safety as he moves about the compressor. Fly wheels should be covered and hot pipes adequately marked. All pop valves should vent in a safe direction so as not to endanger the operator when they are actuated. On an otherwise adequately designed compressor, lack of proper machine guarding can be the greatest hazard.

Regular Maintenance - Proper maintenance is essential for the safe efficient operation of an air compressor. The power supplying the compressor should be eliminated and tagged or locked out before any maintenance is performed. The following checks should be made when maintenance is performed:

Are safety valves properly regulated?

Are compressor valves tight?

Are governors set at the proper speed?

Are unloaders in good working condition?

Are pressure gauges in good condition? Are their sight glasses clear?

Although compressed air has played an important part in the elimination of hazards in industry, new hazards may be introduced if air compressors are operated without due care for safety.

# SAFE OPERATION OF MOBILE AERIAL TOWERS

Neal Fox, Mobile Industrial Equipment Inspector
U. S. Army Ballistics Research Laboratories

"Mobile Aerial Tower" - These words describe a comparatively new piece of equipment that appeared on the American industrial scene during the late 1950's and is in current use by the Army.

The mobile aerial tower will lift a man and his equipment from ground level to altitudes in excess of 50 feet in a matter of seconds. These units are capable of lifting loads up to 600 pounds and rotating the loads up to 360 degrees, with vertical and horizontal control. The towers are usually truck mounted and have the added advantage of mobility.

This versatile machine is responsible for linemen, tree trimmers and maintenance men putting their climbers, ladders and scaffolds into semi-retirement. This equipment makes it possible to do the job better, faster, cheaper and with less manpower. What, then, remains to be said about this product of American ingenuity and the Machine Age?

Any machinery or equipment used to elevate personnel is potentially dangerous. These dangers become a reality, or are compounded, in the hands of careless, unauthorized or untrained operators.

Observance of the following rules will insure maximum operator safety and will reduce the potential dangers involved in operation of a mobile aerial tower:

1. Assigned and licensed operators only should be permitted to operate the controls.

2. Operators must be thoroughly acquainted with the operation instructions and operational limitations of the equipment.

3. Equipment must be inspected and lubricated at regular intervals.

4. Repairs and adjustments should be made only by qualified mechanics.

5. Equipment should be completely overhauled at the end of a three-year period or 6,000 hours of use, whichever comes first.

6. Units must not be operated without outriggers in the lowered position and shutoff cocks in the closed position.

7. Do not under any circumstance exceed the rated capacity of the platform or bucket.

8. Use extreme caution when operating on uneven terrain or sloping surface. On uneven ground avoid operating on the low side of the unit.

9. Do not allow the platform or bucket to descend on a fixed object.

10. Operate controls smoothly without jerking.

11. Never operate the unit from the platform or bucket with the "dead man" switch inoperative or the auxiliary "dead man" switch at the turntable engaged. The "dead man" is a spring loaded switch that activates the controls. If the controls can be operated with the "dead man" switch in the open position, the unit is unsafe.

12. Keep all parts of equipment, the lines and suspended load at least ten feet from energized electrical lines. If it is absolutely necessary to operate the tower close to power lines, arrangements should be made to have the electrical power shut off and positive action taken to prevent the lines from being energized.

In addition to the precautions listed above, other precautions are necessary when operating in close proximity to electrical power lines:

1. On steel boom models, the insulating gap between operator and ground should be regularly cleaned, tested and protected from moisture. The insulating gap is the distance between the insulated bucket and the steel upper boom.

2. On models with nonconductive buckets and upper booms, the link in the platform cables plus the bucket insulation should be protected from dirt and moisture.

3. Never use the unit around power lines with moisture on the bucket and boom. Avoid operating the unit in the rain or fog.

4. If the unit is stored outdoors, protect the bucket from the weather when not in use.

5. On units equipped with "dead man" switch on the floor, clean out dirt from around switch daily.

6. Use only approved fluid in the control head. Never use automotive brake fluid in control heads because it is very conductive to high voltage.

7. Remember that auxiliary equipment such as electrical cords, communications lines, and water hose serve to bridge the insulation between operator and ground and render the insulation useless.

8. Remember that your equipment cannot protect you between two electrical phases. Never work between wires. Keep personnel on the ground from touching truck while tower is near power lines.

Make no mistake about it, operating a mechanical unit fifty feet in the air is not child's play. However, if the operators are properly trained, the equipment properly maintained, the dangers and hazards recognized and guarded against or eliminated, then the only "dead man" in the bucket will be a mechanical switch.

The truck mounted mobile aerial tower is in a ready-for-travel position. The outriggers and ladder are up and the booms are secured in their cradles.

The tower and a man in the bucket are being raised. Before the equipment was used a maintenance check had to be completed, the brakes locked and the protective equipment, overhead hazards and safety devices checked.

The mobile aerial tower has been raised to a working level. The outriggers are down and locked and outrigger valves are closed. The "dead man" control can be activated from the bucket, and all controls are operative.

# INDUSTRIAL VISION

L. C. DeNatale, O.D.
Industrial Vision Optometrist
Watertown Arsenal

The primary objective of an industrial vision program is the conservation of vision by periodic vision screening to rule out any defect, either optical or organic, which may jeopardize the visual mechanism. It must also provide proper optical aid in the form of safety glasses to protect the organ of sight against injury, eye strain, and prolonged exposure to harmful rays.

The vision conservation program at Watertown Arsenal may be divided into three phases: visual screening, corrective protective and plano protective.

It is the intention of this program to conduct periodic group screening. This includes careful inspection of the inside and outside of the eyes to detect any condition which may have medical implications. Ultimately all personnel at Watertown Arsenal will participate in this phase.

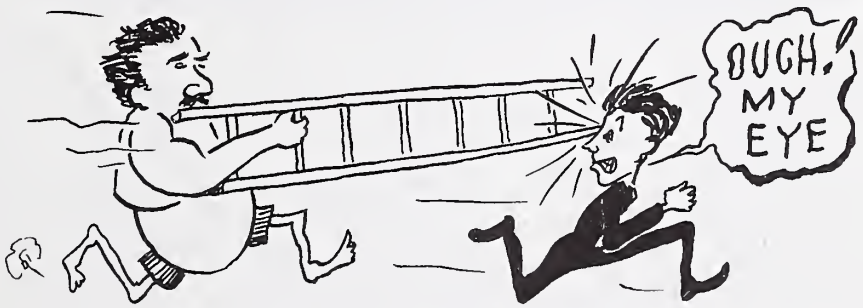
The value and need for a program such as this is attested to by a recent group screening survey of 63 Arsenal employees. It was found that although 43 (68 per cent) showed that their vision was within normal limits, 20 individuals (32 per cent) showed some defective vision; i.e., one person out of every three needed professional attention. It is interesting to note that a similar conclusion was arrived at by an independent vision screening survey conducted in New York using the same instrument. Out of 969 people tested, 30 per cent were found to fall short of reasonable visual standards. This confirmed again that one person out of every three needs professional eye care.

It can be concluded that most people neglect their vision because they do not realize that it is not as good as it could be. Once they have realized this and have secured the proper professional eye care, they will enjoy greater security on the job, greater safety on the highways and greater comfort in everyday living.

The corrective protective phase of the vision conservation program includes servicing all employees whose duties require eye protection and those whose eyes need optical assistance. Upon receipt of a spectacle prescription, industrial safety glasses, which are best suited for his particular skill, are fitted to the recipient. When the eyeglasses are received from the optical supplier they are verified and analyzed with special instruments by the Industrial Vision Optometrist before they are fitted to the individual.

Recently the plano protective phase of this vision conservation program was revised to improve service and comfort to the employee. It was recognized that the wearing of plano eyewear on the job by individuals who normally do not require eyeglasses requires well-fitting protective eyewear for comfort. It was evident that distribution of these eyeglasses through tool cribs and supervisors was not resulting in maximum employee comfort and acceptance. All plano protective eyewear is now fitted professionally in the Industrial Vision Office with the same care and accuracy as the corrective protective or prescription glasses. The fitting data is recorded on individual cards and filed for future reference in case of loss, replacement and repair. The response to this phase of the program has been a significant increase in wearer acceptance throughout the Arsenal.

Our fundamental objective at Watertown Arsenal is to avert eye injuries and conserve vision by an active accident prevention program. Gratifyingly, the eye injury records since the inception of this program have shown a steady decline to the point where there were two eye injuries in December 1963 and only one in January 1964. "No eye injuries" remains our goal.




*"FORESIGHT . . . . OR NO SIGHT"*

## ● EYESIGHT SAVED BY SAFETY GLASSES

Two employees of the Tobyhanna Army Depot recently saved their eyesight through their on-the-job use of safety glasses. They earned for their installation a chapter charter in the Wise Owl Club of America. Colonel James F. Showalter, Deputy Commander of the Depot, is shown as he received the charter from John Horst of the Pennsylvania Office for the Blind, Department of Welfare. William Hughes, left, and Joseph Liparulo, who saved their eyesight, hold membership emblems. The Wise Owl Club is sponsored by the National Society for the Prevention of Blindness, Inc.

## ● EYE PROTECTION TRAINING REACHES FAMILY

The 100 per cent eye protection program at Watervilet Arsenal has its influence beyond the installation. Bob Meeker, a welder, is furnished safety glasses and he values them to the extent of insisting both his wife and his daughter Beverly (above with Bob) wear safety glasses also. As a result, Beverly escaped eye injury when a piece of quartz flew from a workbench in a Junior Achievement workshop, struck one of her safety lenses and nearly knocked the glasses off her face. She was not injured -- just "surprised" and grateful for the lesson her Dad had learned on the job.

# EXPLOSIVES SAFETY

## EXPLOSIVE HAZARDS OF DRY CALCIUM HYPOCHLORITE

C. D. Chin and D. G. Schley
U. S. Army Biological Laboratories, Fort Detrick

Dry powdered calcium hypochlorite, or chlorinated lime as it is often called, can produce burning or explosion when exposed to steam under pressure in the presence of organic material. Therefore, processing of this material in laboratory autoclaves should be prohibited.

Recently at the U. S. Army Biological Laboratories an explosion occurred during the autoclaving of several pounds of powdered calcium hypochlorite, a small can of lubricating oil, a Magic Marker, and a towel.

Fortunately no one was hurt.

Follow-up tests showed that one to five grams of dry calcium hypochlorite autoclaved with oil, or dibutyl phthalate, or a Magic Marker wick, or fiberboard, or absorbent cotton, readily detonated or burned in the autoclave. It is believed the explosion was caused by a combination of liberated oxygen with organic material.

# AEROSOL CANS - HANDLE WITH CARE

The convenience of the push button can for dispensing sprays and liquids has won it a hearty public acceptance. Hundreds of products are now marketed in such cans and the number is growing. So is the demand, with annual sales already exceeding a billion cans.

From the start it was recognized that the aerosol container, if improperly handled, could present a hazard tc its user. The aerosol can is a pressure container which may rupture or explode with devastating effects if improperly used.

Since it is a pressure container, the Federal Hazardous Substances Labeling Act requires that every aerosol can bear a printed warning. The wording used varies according to the product and the particular hazard involved. Unfortunately, the instructions are often incomplete and also inconspicuous because of the use of small print and light letters. The consumer is therefore frequently unaware of the hazard he may encounter.

Aerosol containers may be made of tin-plated steel, stainless steel, aluminum, glass, plastic and plastic-coated glass. The material used depends upon the product to be dispensed and the amount of propellent pressure required. The propellent may be either a compressed gas or a liquid gas.

The commonly used compressed gases are nitrogen, carbon dioxide and nitrous oxide. Argon and helium are sometimes used. These gases are inert, non-corrosive, non-toxic and non-flammable. They work well with food products. They have the disadvantage of requiring comparatively high packing pressures, usually about 100 pounds per square inch at 70°F. The high pressure is required because the pressure in the can drops some every time the product is dispensed.

Hydrocarbons and fluorocarbons are the generally used liquified gas propellents. Because the internal

pressure of the container does not drop whenever some of the liquid gas is released, it is possible to use much lower packing pressures, averaging between 40 and 70 pounds per square inch at 70°F. Since liquified gases boil at normal room temperatures and pressures, they vaporize the dispensed product into tiny particles as it leaves the valve of the container.

The liquified hydrocarbons bear such familiar names as propane, n-butane and methylene chloride. They are usually toxic and flammable. The fluorocarbons use trade names such as freon and are non-flammable. If they are swallowed or brought into contact with the eyes some individuals will find them irritating or a cause of reactions.

The explosive potential of aerosol containers was demonstrated during recent insurance company tests, when full cans were tossed into a bonfire. Some cans ruptured almost instantly and shot like rockets for 300 feet. The tailgate of a pickup truck 150 feet from the fire was pierced by two direct hits.

In spite of the potential hazards that exist in these ever-present pressure containers they can be used quite safely by anybody who will take a few simple, common-sense precautions.

Children should not be allowed access to aerosol cans. They will not understand or be likely to appreciate the potential hazards.

The printed warning on every can should be read carefully before the contents are used. It is particularly important to learn whether the mixture is flammable.

The containers should not be stored in locations where they are exposed to direct sunlight or temperatures above 100°F. The heat may cause the pressure inside the can to reach a dangerous level. A heated can may explode like a grenade.

Aerosols should not be stored in tightly closed areas. The can may leak and cause a hazardous accumulation of flammable gases.

Aerosols should be used only in well ventilated areas. The gases may be toxic or irritating, or flammable quantities may accumulate.

Aeosols should not be used near open flames or lighted cigarettes. Its propellant may be a flammable liquid gas.

The container should not be punctured. The sudden release of its internal pressure can be very hazardous.

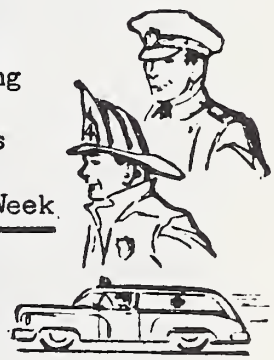
The discarded can should never be thrown into an open fire or an incinerator. It may still contain enough propellant to cause an explosion.

Aerosols are here to stay and their usefulness will make them more common every year. Used improperly they can be extremely hazardous. Used properly they are convenient and safe.

* * *

## PRESIDENTIAL PROCLAMATION

By Proclamation 3595, President Johnson has designated the week beginning 4 October 1964 as Fire Prevention Week.



# SAFE DISPOSAL OF AEROSOL SPRAY CANS

Paul T. Ruda, Safety Officer
Letterkenny Army Depot

With the tremendous increase in use of aerosol spray cans, safe disposal of "empty" cans is becoming a problem.

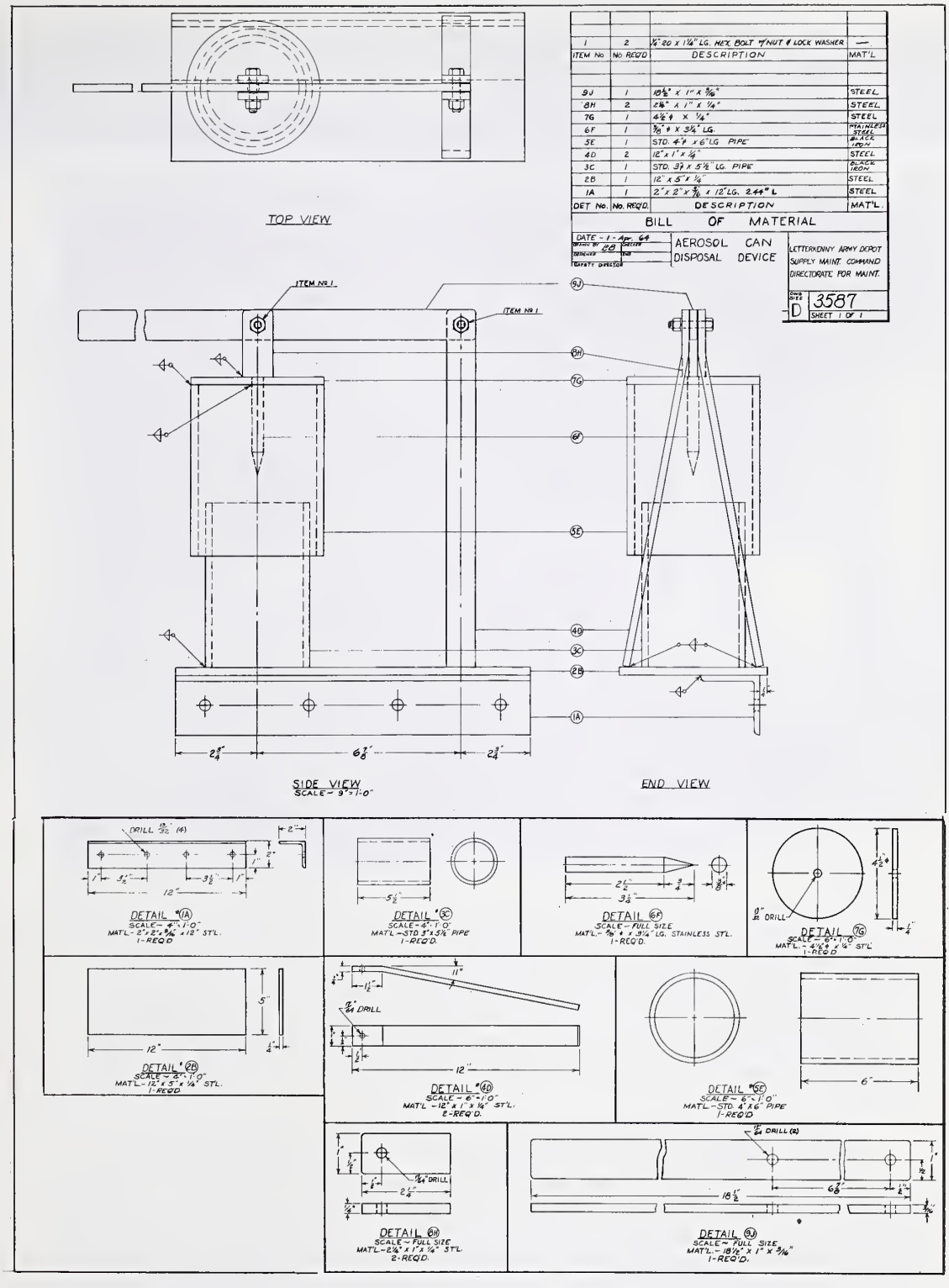
Letterkenny Army Depot has developed a puncturing device to relieve unused pressure in the can and prevent it from building up and exploding if it should be burned.

Puncturing with the device shown in the photograph and drawing eliminates this explosive hazard.

A Standing Operating Procedure has been written covering the issuance, storage, handling and disposal of aerosol spray cans. Disposal of the cans by both military dependents living on the depot, and personnel of shops, warehouses and offices, is outlined so that the cans will be punctured before disposal.

When the photograph is compared with the drawing, it will be seen that the location of the device's two cylinders have been reversed. The small cylinder is affixed to the stand, and the larger one is attached to the lever. This modification of the puncturing device affords the operator an even greater measure of safety.

Aerosol can is placed head down inside cylinders and is punctured when top cylinder is lowered.




| ITEM No | No. REQ'D | DESCRIPTION | MAT'L |
|---|---|---|---|
| 1 | 2 | ¼"-20 x 1¼" LG. HEX. BOLT 'n' NUT & LOCK WASHER | — |
| 6J | 1 | 10½" x 1" x 3/16" | STEEL |
| 6H | 2 | 2½" x 1" x ¼" | STEEL |
| 7G | 1 | 4½" ϕ x ¼" | STEEL |
| 6F | 1 | 5/16 ϕ x 3¼" LG. | STAINLESS STEEL |
| 5E | 1 | STD. 4" ϕ x 6" LG. PIPE | BLACK IRON |
| 4D | 2 | 12" x 1" x ½" | STEEL |
| 3C | 1 | STD. 3" ϕ x 5½" LG. PIPE | BLACK IRON |
| 2B | 1 | 12" x 5" x ¼" | STEEL |
| 1A | 1 | 2" x 2" x 3/16 x 12" LG. 2.44" L | STEEL |
| DET No. | No. REQ'D. | DESCRIPTION | MAT'L. |

DATE - 1 - Apr. 64
DRAWN BY RB
DESIGNED TAB
SAFETY DIRECTOR

Drawing showing device to relieve unused pressure in aerosol spray cans.

# HOME SAFETY EMPHASIZED AT U.S. ARMY MISSILE SUPPORT COMMAND

The number of disabling injuries received in home accidents outnumber those received at work two to one. When the 1964 Armed Forces Day open house was planned at Redstone Arsenal the personnel of the Army Missile Support Command availed themselves of the opportunity to promote safety in the homes of all who attended the event.

Shown above is one section of the "Home Safety" booth that was given an enthusiastic reception by its viewers. Over 50 home hazards were shown in the display. Members of the Safety Division were on duty at the display to talk safety with visitors and to distribute home safety check lists. Eleven thousand copies of a home safety check list and the procedure for mouth-to-mouth artificial respiration were handed out.

# CURRENT EVENTS

## ● BOUNCING INSPECTOR BUMPS HEAD

The Army inspector was checking an item of government production equipment that had been loaned to a contractor. He found that the numerical identifying tag was located a little too high on the machine for him to read it. He tried jumping up and down, hoping to be able to make out the numbers during the instant when his eyes would be level with them. He failed to make allowance for a length of angle iron that projected from the top of the machine. He bumped his head sharply against the beam, and his head injury was so severe that he missed two days work.

The projecting beam was high enough above the floor to provide complete clearance for anybody who needed to walk beneath it. The inspector was instructed to be more attentive to his surroundings while performing his duties in machine shops. He was also advised to use a ladder to reach heights above his head level.

## ● OVERLOADED ELEVATOR DESCENDS

The end of their workday was fifteen minutes away. Four forklift operators who had been busy on an upper floor of a building were returning their machines to the Motor Pool. One of the operators secured an elevator to transport the men and their equipment to a lower floor.

The first operator drove his forklift upon the elevator to a carefully selected position on one side of the car. The second operator then entered the cage and parked his forklift with its forks under the boom of the first machine. The third operator drove inside and turned his equipment to make room for the remaining man and machine. The fourth operator drove upon the elevator and tried to place the forks of his forklift under the boom of the third machine.

Before the fourth operator could complete the placing of his forklift the elevator car began to slip. The operator attempted to back off the platform, but he did not have enough time to complete the movement. The moving car pinned the forklift in the doorway with its rear wheels outside on the floor and its front wheels in the air inside. The car dropped two feet and was stopped when its roof came to rest on the boom of the forklift caught in the open door. Damage to the elevator gate and roof were estimated at $600. The forklifts were not damaged, and the operators escaped uninjured.

The total weight of the four forklifts was 29,128 pounds, while the elevator had a capacity of 20,000 pounds. It was made clear to the operators that the lifting capacity of a forklift was not the weight of the machine and that only one forklift would be allowed on an elevator at one time. Safe load markings were also re-stenciled on the elevator shaftway doors.

## ● HER OFFICE WAS ROUGH

The office in which she was working was unfamiliar to the newly selected secretary. She was proofreading a typed disposition form when she decided a word should be checked. The dictionary was on a table to the left behind her and she shoved her wooden typist chair away from her desk as she reached for it. The chair came to a sudden stop when one of the castors dropped into a

patched electrical outlet hole on the floor. The momentum of the secretary's body caused the chair to turn over sideways. As she fell her head struck a concrete block wall behind her, and she landed sitting on one of the legs of the chair.

The bruised secretary completed her work shift and drove home, but the next day her pains caused her to visit a doctor. He found a fractured terminal facral vertebra, and she was away from work for five days.

All holes in the floor of the building were repaired and employees were cautioned to be alert for similar unsafe conditions.

## ● WIND UPSETS WORKING CRANE

A 25-ton capacity truck mounted crane was being used to remove a radar antenna from a 23-foot high platform. The crane was equipped with an 80-foot boom, its outriggers were in place, and a lifting capacity of 10,500 pounds at a 40-foot radius was available. The weight of the items to be lifted was well within the limitations of the equipment.

As the work progressed the wind became increasingly strong and gusty. A screen assembly and the shield covers for the base were lowered to the ground. A hook-up was then made on the 7,440-pound antenna base. The load was lifted high enough to clear a one-foot rail and was swung far enough to the left to clear the platform. After receiving a signal, the operator then lowered the load until it was about six feet above the ground, high enough to allow clearance for protruding bolts when he swung the load to a designated point 20 feet away from the platform.

At this moment a gust of wind reached an estimated 45 miles per hour velocity. The force of the wind on the load caused it to swing out beyond the point of the boom, thereby increasing the working radius and decreasing the crane capacity. The crane began to tilt. The operator attempted to partially raise the load in order that the power let down device could function. This lifting attempt added to the tilting effect, and a jack jumped out from underneath an outrigger. The crane turned over on its side.

The operator was not injured. Damage to the crane exceeded $3,600.

The accident was attributed to failure to recognize the hazard that could be produced by a combination of a high wind, a long boom and a bulky load. Corrective actions included instructions for safe crane operation and emphasis on using better judgement in evaluating factors that could create operating hazards.

## ● ROAD ROLLER RUNS AWAY

Early in the morning a road roller was started toward a work site a mile and a quarter away. The machine, with its compression and guide rolls filled with water, weighed about 17,500 pounds. It was driven by a licensed and experienced employee who was considered to be a skilled operator. He had driven the roller over the route he was to use.

At one point the road descended a long and fairly steep grade. The heavy roller began to pick up speed, and the drive suddenly became disengaged. The operator attempted to control the equipment by braking, but the brakes proved to be ineffective. The machine continued to gain speed. Despite the efforts of the operator to drive straight down the road while he tried to re-engage the gears, a "fishtailing" motion began. The roller swerved across the shoulder at a filled point in the road. Just before it tumbled down the bank the driver leaped for life. He landed hard on the roadside, fracturing his left ankle and right knee.

The road roller apparently received no major damage as a result of the accident. After it was recovered from the ditch it was driven to the work site.

A board which investigated the accident made the following recommendations:

1. Consideration should be given to transporting or towing the road roller between work locations.

2. To prevent the road roller from jumping out of gear appropriate modifications should be performed.

3. Upon his return to work the injured operator should be retested and retained.

# ✓ CHECK THOSE LINEMAN'S SAFETY STRAPS

U. S. Army Supply
and Maintenance Command
Safety Field Office

The lineman climbed the utility pole to the height where work was to be done, placed his leather safety strap around the pole and connected the snap tongue on the strap to the D-ring. He then leaned back and placed his weight on the belt. The strap broke. The lineman avoided a 20-foot fall to the ground by grasping a guy wire and a communication cable.

Possible causes of the failure of the belt (see photo) include: subjecting deteriorated leather to sharp bends which caused cracking and weakening of the strap, damage by a sharp object, and holes for tongue of buckle becoming damaged or torn.

Examination of the eight remaining lineman's safety belts in the installation stock revealed that six were not safe for issue because of deterioration and cracks.

TM 5-682 contains instructions which if followed should prevent accidents caused by failure of leather safety straps. Before starting a job each employee should inspect the equipment he will use to insure it is suitable and in good condition (paragraph 13e). Personal protective equipment, tools and devices should be inspected weekly by the foreman or a properly delegated employee (paragraph 13c). Leather body belts and safety straps should be cleaned and dressed every three months or more frequently if they become wet with rain or perspiration (paragraph 47j). Those showing evidence of cracks or deterioration should not be used (paragraph 47b(1)).

Where conditions are encountered that cause rapid deterioration of leather, nylon belts and safety straps should be used.

Lineman's safety belt which failed when he was on utility pole.

# DO YOU KNOW?

Here are ten questions that will test your knowledge of information you will need under different circumstances. The answers to all of them are available in AMCR 385-224. How many can you answer before referring to the regulation? The correct answers and references appear on pages 39 and 40.

1. Give the number and size of the exits required for each operating room or building containing explosives when it is occupied by more than two persons.

   Answer:

   Reference:

2. How many persons shall be permitted to ride in the cab of a truck transporting explosive material to burning or demolition ground?

   Answer:

   Reference:

3. When is a substantial dividing wall adequate for reducing distance for Class 9 pyrotechnic material?

   Answer:

   Reference:

4. What action must be taken before a motor vehicle may be loaded with dangerous articles, as defined by the Interstate Commerce Commission, for movement over public highways?

   Answer:

   Reference:

5. What is the distance required between containers of explosives or ammunition items awaiting destruction at a destruction site?

   Answer:

   Reference:

6. What is adequate protection for disassembly operations involving items containing 15 pounds or less of explosives, and what are the operating restrictions?

   Answer:

   Reference:

7. What is meant by explosionproof with reference to electrical equipment?

   Answer:

   Reference:

8. What is the standard used for the periodic inspection of hoists?

   Answer:

   Reference:

9. When must stairways be provided with handrails?

Answer:

Reference:

10. What is the minimum classification of fire extinguishers that are required on motor vehicles transporting explosives on an AMC establishment?

Answer:

Reference:

## OBSERVING SAFETY REGULATIONS

All employees are expected to observe the applicable posted rules and signs and written or verbal instructions relating to personal safety. In addition to avoiding accidents, employees are expected to report potential accident and fire hazards to the proper officials and to cooperate fully with the safety officer to assure that the safety of persons or property is not endangered. Willful nonobservance of the governing safety regulations through acts of the nature described below constitute grounds for disciplinary action:

1. Failure to report an accident involving injury to persons or damage to property or equipment.

2. Failure to use protective clothing or equipment.

3. Endangering the safety of or causing injury to personnel or damage to property or equipment through carelessness or negligence.

4. Smoking in unauthorized places or carrying matches in explosive areas.

Civilian Personnel Regulation CPR C2
February 1964

# NATIONAL SAFETY COUNCIL AWARD

## ROCK ISLAND ARSENAL WINS NSC AWARD OF HONOR

Brigadier General Roland B. Anderson (left), Commanding General of U. S. Army Weapons Command, is shown presenting National Safety Council Award of Honor to Colonel Paul A. Nilsson, Commander of Rock Island Arsenal. The award was made for the Arsenal's safety record of more than 3 1/2 million manhours of work without a disabling injury. This is the fourth National Safety Council Award Rock Island Arsenal has received since 1961.

## RADFORD ARMY AMMUNITION PLANT RECEIVES NSC SAFETY AWARD OF HONOR

Lt. Col. J. S. Jones, Commanding Officer, is showing J. C. Foster, Plant Manager, that the National Safety Council Award of Honor presented to Hercules Powder Company, Contractor Operator of the Plant, is for working 4,000,000 safe manhours from October 63 to May 64. C. W. Lay, Safety Officer, and L. C. Estus, Hercules Safety Superintendent, are pictured on the right. The installation is well on its way to 5,000,000 manhours of accident-free work.

The previous all time high for RAAP's no-injury record was established in August 1958 after accumulating 8,415,077 safe manhours. This still stands as the nation's best record in the Fuzes and Powder Division as recorded by the National Safety Council.

# USA NATICK LABORATORIES PRESENTED NSC AWARD OF MERIT

Brigadier General Merrill L. Tribe, Commanding General, U. S. Army Natick Laboratories, Natick, Mass., is shown receiving the National Safety Council Award of Merit. The presentation was made by John S. Reissenweber, a member of the Board of Directors of the Massachusetts Safety Council. The Natick Laboratories earned the citation for the operation of 1,367,741 manhours without a disabling injury.

# WATERVLIET ARSENAL WINS SAFETY AWARDS

Twenty-two awards, including a grand award, were garnered by Watervliet Arsenal at the awards banquet for the annual accident prevention campaign of Associated Industries of New York State. The Arsenal's Transportation Office received the grand award in its category as the best entry in the state with the best combination of total manhours and lost time injury frequency rate (no injury).

Watervliet Arsenal with no disabling injury for the campaign period was second in the statewide event, comprising more than 1,600 entries. The annual campaign is held during the first 12 weeks of the year.

Watervliet entries also won six eight-year awards, for eight consecutive campaigns without a disabling injury; **four seven-year awards, and one five-year award.** None of the Arsenal's 21 entries had a disabling injury. While the Arsenal recorded a zero frequency rate, private industrial entries in the Troy Area compiled a rate of 4.5. The rate for all participants in New York State was 5.9.

# U. S. ARMY BIOLOGICAL LABORATORIES WINS NSC AWARD OF MERIT

The U. S. Army Biological Laboratories was notified that it has qualified for a NSC Award of Merit for operating 1,572,000 manhours without a disabling injury from 2 January 1964 to 28 March 1964. Personnel of the Biological Laboratories are congratulated for this fine achievement.

# REFERENCE PUBLICATIONS

AR 55-55, 30 June 1964
Transportation and Travel, Transportation of Radioactive and Fissile Materials Other Than Weapons.

AR 330-136, 22 November 1963
Statistical and Accounting System, Accident Statistical Punched Cards.

AR 385-40, Change 1, 30 June 1964
Accident Reporting and Records.

AR 385-41, Change 4, 1 July 1964
U. S. Army Accident Code Book.

AR 608-10, 15 July 1964
Personal Affairs, Motor Vehicle Liability Insurance.

AR 600-140, Change 3, 8 July 1964 (Effective 1 November 1964)
Personnel-General, Line-of-Duty Determinations.

AR 746-5, 30 June 1964
Marking and Packing of Supplies and Equipment, Color and Marking of Army Materiel

AMCR 385-3, Change 1, 10 April 1964
Reports of Explosions, CBR Agent Releases, Serious Accidents, and Nuclear Incidents at AMC Installations and Activities.

DA PAM 350-60, June 1964
Announcement of Army Extension Courses.

American Standard Safety Code for the Use, Care, and Protection of Abrasive Wheels, B7.1-1964-

# WELL DID YOU KNOW?

Here are the answers to the questions on pages 31, 32, and 33. All questions were based on information contained in AMCR 385-224. A reference to the pertinent paragraph follows each answer.

1. At least two exits shall be provided, and the exits should be at least 30 inches wide and located at opposite ends or sides of the area involved.

   Reference: Paragraph 507, AMCR 385-224.

2. No more than two persons shall ride in the cab.

   Reference: Paragraph 2714a, AMCR 385-224.

3. A substantial dividing wall is adequately barricaded for 100 pounds or less of Class 9 pyrotechnics that are located at least four feet from the wall.

   Reference: Paragraph 1727, AMCR 385-224.

4. The vehicle must be inspected for compliance with AR 55-355.

   Reference: Paragraph 2204, AMCR 385-224

5. Ten (10) feet.

   Reference: Paragraph 2714c, AMCR 385-224.

6. A 12-inch reinforced concrete wall is adequate protection when the item is at least three feet from the wall and two feet from the floor.

   Reference: Paragraph 2504a, AMCR 385-224.

7. The term explosionproof refers to electrical equipment that is enclosed in a case which is capable of withstanding an explosion of a specified gas or vapor which may occur within it and of preventing the ignition of the specified gas or vapor surrounding the enclosure by sparks.

   Reference: Paragraph 603d, AMCR 385-224.

8. American Standards Association Code for Cranes, Derricks and Hoists.

   Reference: Paragraph 905a, AMCR 385-224.

9. Handrails must be provided when stairs are four or more risers in height.

   Reference: Paragraph 511, AMCR 385-224.

10. Class 1-B, C.

    Reference: Paragraph 2205d, AMCR 385-224.

HEADQUARTERS
UNITED STATES ARMY MATERIEL COMMAND
WASHINGTON, D. C., 20315

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(AMCAD-S)

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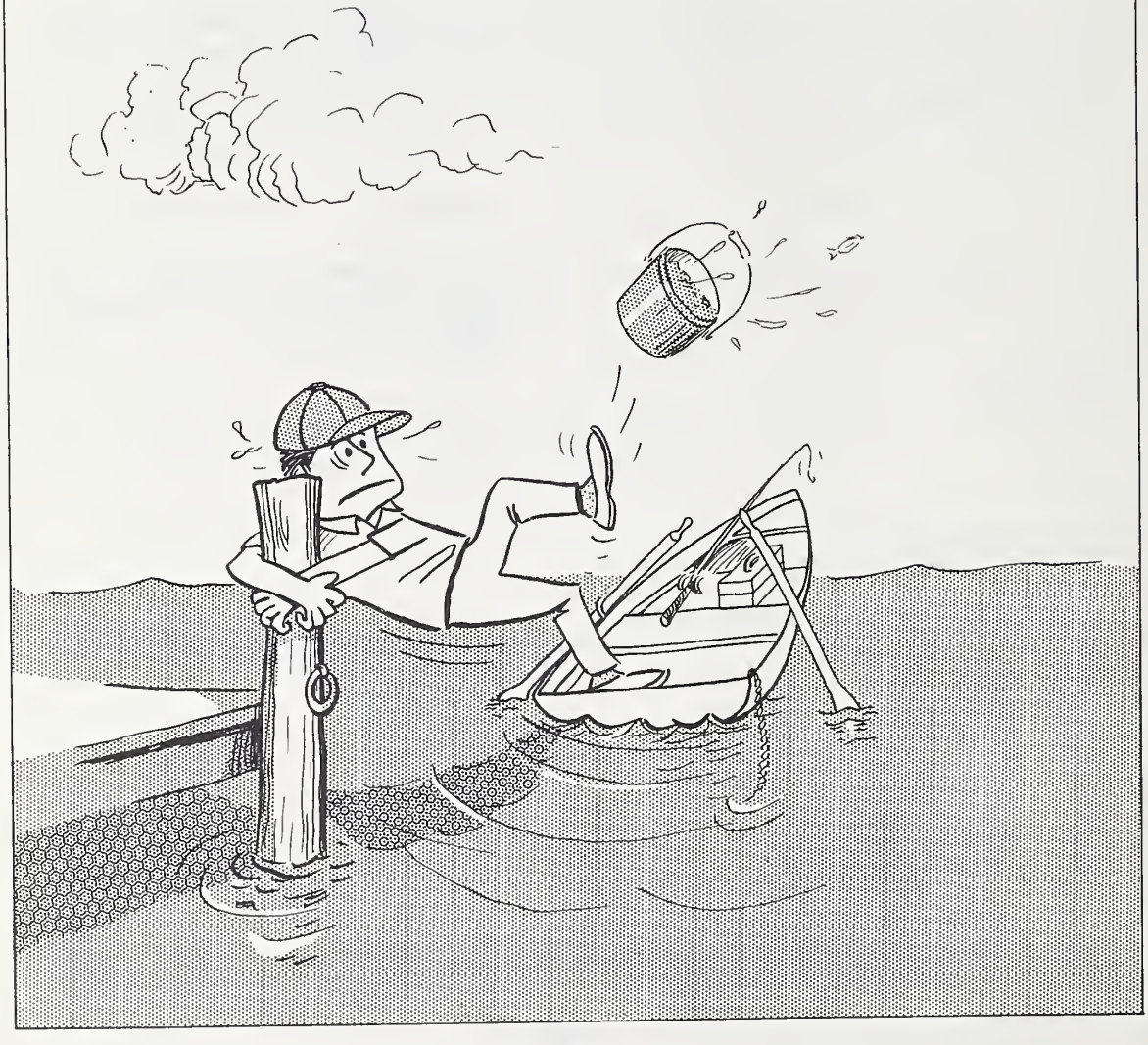
Distribution:
Special

# EVERY NEAR ACCIDENT IS A WARNING . . .



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